






Effects of vermicompost-tea on plant growth and crop yield

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Content

- Production of vermicompost-tea
- Quality defining analysis parameters
- Reproducibility and storage stability
- Laboratory (greenhouse) trials
- Field trials



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Production of vermicompost-tea

general





- **main source is Vermicompost**
 - digestion product of organic material by earthworms (*Eisenia fetida*, *E. andrei*, *Lumbricus rubellus*, e.g.)
- **eluted with water**
 - to isolate micro-organisms and solubles
- **and additives**
 - which act as feed for the MO's
- **to gain a liquid product**
 - that can be sprayed to plant leaves
- **with plant supporting properties**

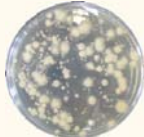


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Analysis

of vermicompost-tea and soil





- **Chemical parameters**
 - pH-value, conductivity (EC), absorbance (colour), dry weight (DW), main nutrients (NO_3^- , NH_4^+ , K^+ , P_{total} , Mg^{2+})
- **Microbiological parameters**
 - conventional: bacteria & fungi CFU, respiration
 - molecular biology: bacteria & fungi (PCR/DGGE)
- **Biological parameters**
 - lab greenhouse: biomass of cress and tomatoes
 - field: yield & quality of wheat, barley, peas, rucola, radish
 - production greenhouse: yield & quality of tomatoes



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Vermicompost-teas

produced under different conditions



Production additive	E_{485nm} (colour)	NO_3^- [mg/l]	K^+ [mg/l]	P_{tot} [mg/l]	Fungi (CFU/ml)	Bacteria (CFU/ml)	Shannon- index b.
polenta, flour, silica, tap water	0.072	5.9	70	13	$4.0 \cdot 10^5$	$1.0 \cdot 10^8$	2.85
polenta, flour, silica, deionised water	0.201	51	305	23	$6.7 \cdot 10^5$	$7.5 \cdot 10^7$	2.96
polenta, oat bran	0.905	57	405	13	$2.2 \cdot 10^5$	$5.0 \cdot 10^8$	2.95
wheat flour, oat bran, sunflower press cake	0.652	40	324	11	$4.0 \cdot 10^5$	$2.4 \cdot 10^8$	2.98
compost leachate, wheat flour, oat bran	0.149	5.2	95	4.6	$1.9 \cdot 10^6$	$3.1 \cdot 10^8$	2.87
citric acid	0.130	97	94	19	$2.0 \cdot 10^5$	$6.1 \cdot 10^7$	2.73
citric acid, 96 h extraction	0.050	3.4	95	11	$2.1 \cdot 10^6$	$2.8 \cdot 10^7$	3.08
green leaf compost, oat bran	0.103	26	82	1.6	$2.2 \cdot 10^5$	$7.3 \cdot 10^7$	3.09
green leaf compost, oat bran, 96 h extraction	0.060	3.6	82	1.9	$7.1 \cdot 10^5$	$8.8 \cdot 10^7$	3.39
compost leachate, oat bran	0.503	88	288	4.2	$4.6 \cdot 10^4$	$2.7 \cdot 10^6$	3.36
green leaf compost, sunflower press cake	0.116	6.2	97	5.4	$8.9 \cdot 10^5$	$2.5 \cdot 10^8$	3.10

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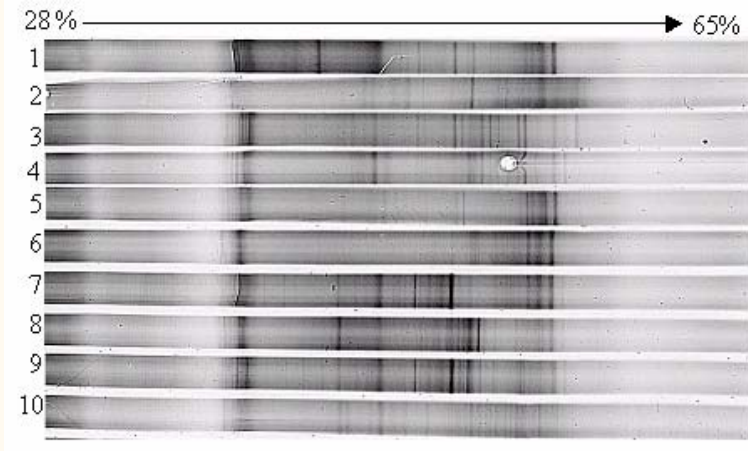
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Vermicompost-teas

different prod. conditions: DGGE

28% ▶ 65%



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Vermicompost-teas

repeatedly produced under same conditions



Rep.	E _{485 nm}	cond. [mS/cm]	DM [%]	NO ₃ ⁻ [mg/l]	NH ₄ ⁺ [mg/l]	Fungi [CFU/ml]	Bacteria [CFU/ml]	Shannon Bakterien
A	0.094	1.49	0.31	3.07	0.11	1.5 * 10 ⁵	1.7 * 10 ⁸	2.45
B	0.129	1.52	0.42	2.78	0.14	2.8 * 10 ⁴	3.8 * 10 ⁸	2.44
C	0.083	1.50	0.40	15.4	0.08	6.6 * 10 ⁴	1.6 * 10 ⁸	2.39
D	0.173	1.56	0.41	5.32	0.16	3.3 * 10 ⁴	2.9 * 10 ⁸	2.23
E	0.099	1.54	0.39	4.25	0.08	1.7 * 10 ⁵	2.7 * 10 ⁸	2.46

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Results

plant growth in lab-greenhouse



- **optimised tea**
 - weekly applied after plants germinated (amount much higher than later at field)
- **growth period: 1 month**
- **up to 200% additional biomass with tea application**






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Results


plant growth in field trial



Rucola (l): no differences were observed



Peas (r): pods of blanks were yellowish, more diseased




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Results


plant growth in field trial





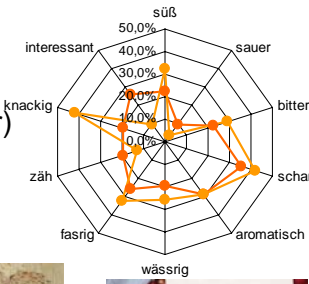
- **Radish**
 - no significant difference in yield, untreated was preferred (crispier, hotter)
- **Wheat & Barley**
 - no significant difference in yield, bread from treated wheat was softer













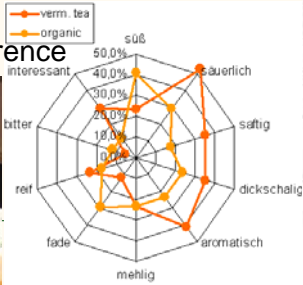

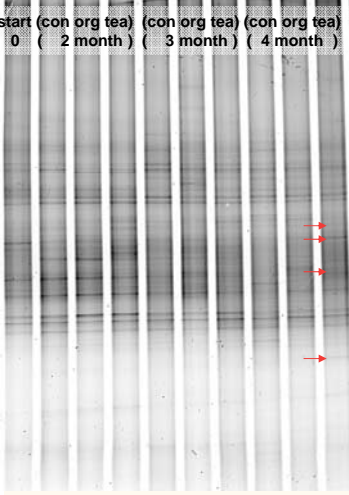
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Results

tomatoes in production-greenhouse






- **setup**
 - control (mineral fert.), organic fertilisation, vermicompost-tea
- **evaluation of growth**
 - yield & quality (sensoric test)
- **result**
 - no yield difference






Conclusions

about vermicompost-tea

- **production of tea**
 - was optimised & protocols for reproducible composition and storage were developed
- **tea is beneficial for plant growth**
 - increased biomass in lab-test, not in field trials
 - improved visual appearance & (sometimes) taste in field trial
- **tea application influences MO-population in soil**
 - final details not yet analysed
- **tea could not be seen as fertiliser**
 - benefit relies on other properties



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Many thanks for your attention!

